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Thesis Title	*Multilayer magnetophotonic materias*
Supervisor	N. Stefanou, Professor
Summary	We present a method for the evaluation of reflection and transmission matrices associated with an electromagnetic wave incident at any angle on the interface between two, in general optically anisotropic, media. We show how, using these reflection and transmission matrices, one can describe the optical response of inhomogeneous layered structures. Using this methodology, we demonstrate that a dielectric magnetic plate, sandwiched between multilayer dielectric Bragg mirrors, induces enhanced Faraday rotation, due to a resonant mode localized in the plate, and explain corresponding experimental data. In addition, we show that a magnetophotonic crystal with a structural unit consisting of three different dielectric layers, one isotropic and two magnetic polarized parallel to the interface in opposite directions, exhibits non reciprocal optical response in the Voigt configuration. We also investigate structures of hybrid spherical nanoparticles consisting of a dielectric magnetic core and a plasmonic shell by the effective medium approximation as well as by means of rigorous full electrodynamic calculations using the layer multiple scattering method. We calculate photonic dispersion diagrams and corresponding transmission spectra providing a consistent interpretation of the results and propose simple design rules for engineering such structures that exhibit enhanced and broadband Faraday rotation, taking advantage of the plasmon-induced strong electromagnetic field localization in the magnetically active material at frequencies of large magneto-optic response.
Key words	Core-shell nanoparticles, Faraday rotation, Magnetophotonic crystals, Photonic band structure, Plasmonic nanoparticles
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